THE HISTORICAL FLOODS OF THE CITY OF BATH

Learnings towards contemporary risk assessment

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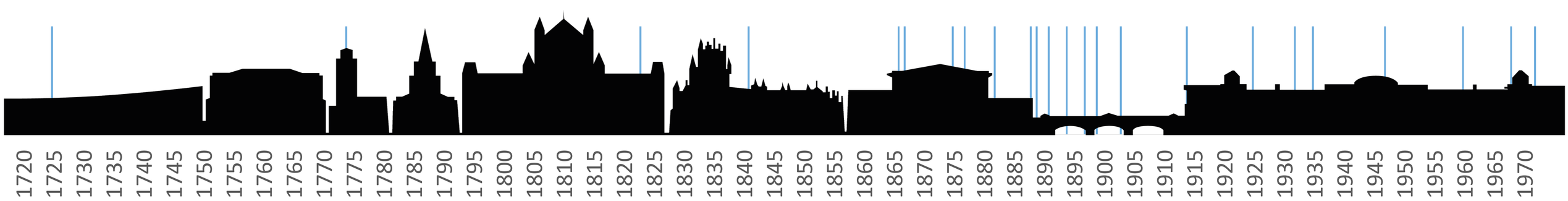
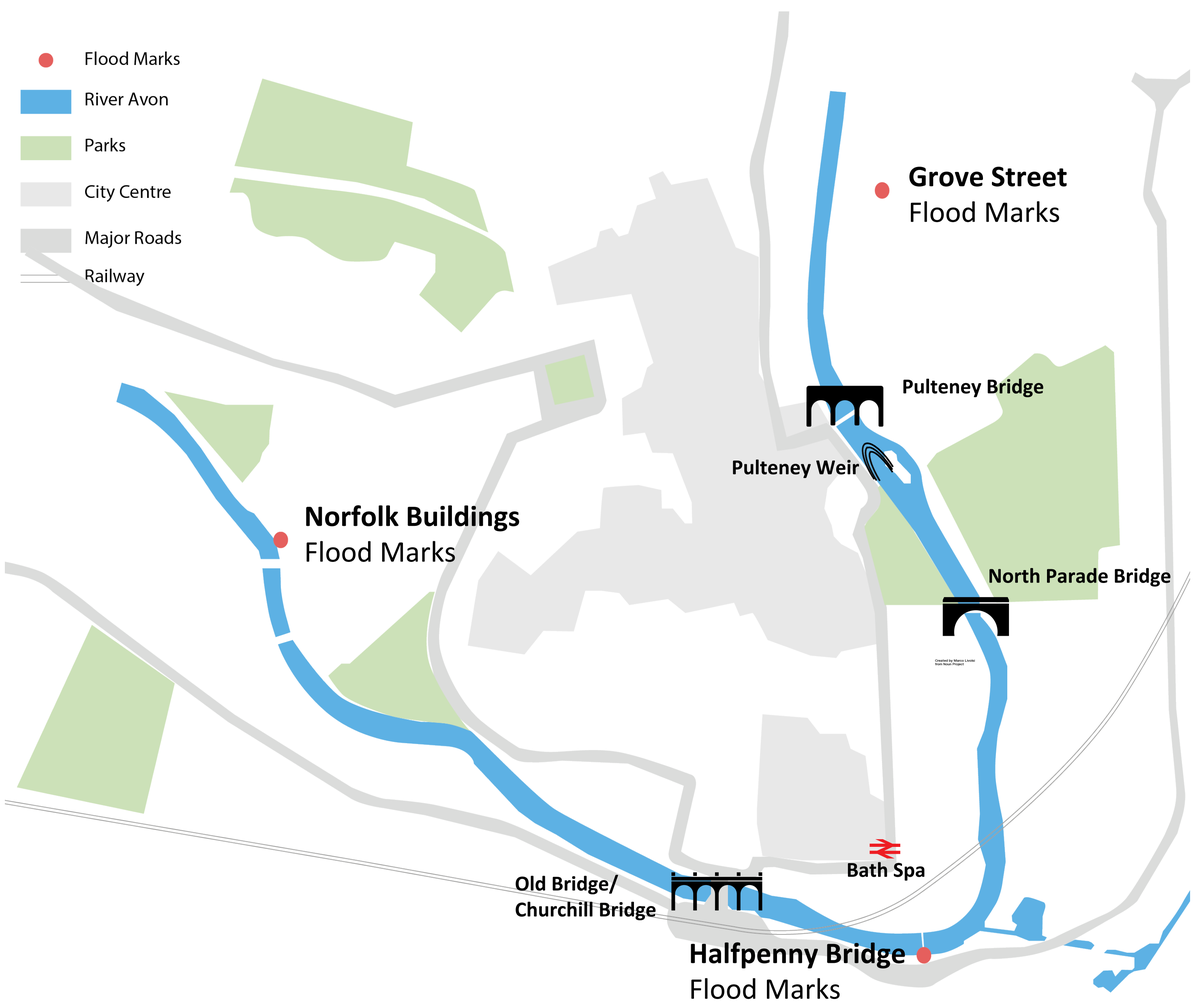
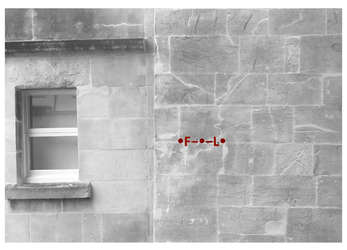
Chronology of past flood events in the city of Bath: 1720-1970



Flooding is a costly problem and estimating the risk of future flood events is of considerable interest. The average record length of annual maximum series (AMS) of peak flow in the UK is around 40 years but most infrastructure is designated to cope with design flood events of predefined return periods (e.g. 1 in 100 or 1 in 10,000 year events). It is clear that considerable interpolation is necessary in most cases, leading to high levels of uncertainty. One strategy for reducing this uncertainty is to try and create a longer data series by augmenting the flood series derived from observed flow series with historical flood events reconstructed from historical evidence. The city of Bath has been chosen as there is a particularly rich record of historical information on the city and river management available, but the methodology will also be applicable to other locations.



Norfolk Buildings Flood Marks: F-L



Grove Street Flood Marks: 1823, F-L

Halfpenny Bridge Flood Marks: 1866, 1867, 1875, 1880, 1882, 1888, 1894, 1897, 1900, 1903, 1925, 1947, 1960

WP 1- Historical Evidence
- Chronology of past flood events
- Inventory of historical evidence
- Rainfall records

WP 2- Hydraulic Modelling
- Hydraulic model using Flood Modeller
- Determine shape of river inflow hydrograph
- Creation of error models

WP 3- Flood Frequency
- Extreme value modelling
- Bayesian modelling framework
- Regional impact

Hydraulic modelling- Flood Modeller

- Investigate shape of typical hydrograph (existing flow data)
- Assessment of typical variation in shape

Inflow hydrograph

1D model

- Input conditions:
  - Cross section
  - Manning's coefficient
  - Inflow hydrograph
  - Boundary conditions

- Establish rate-flow curves at locations with historical flood data
- Establish magnitude of the historical peak flow

Historical flow values

1882 Flood

The City of Bath was unprepared for the 1882 flood event, which is recorded as '*the most disastrous flood that ever visited the district*' (*The Bath Herald*, 1882). The devastative nature of the flood is portrayed in the spatial expansion. The Mayor's Relief Fund served to the provision of food supply and partial restoration of households.

➥In 1892, infrastructure measures for future flood defences were proposed (e.g. river deepening, replacement of bridge, sluice gate instalment, steel piling) but the £100,000 cost was deemed excessive.

1894 Flood

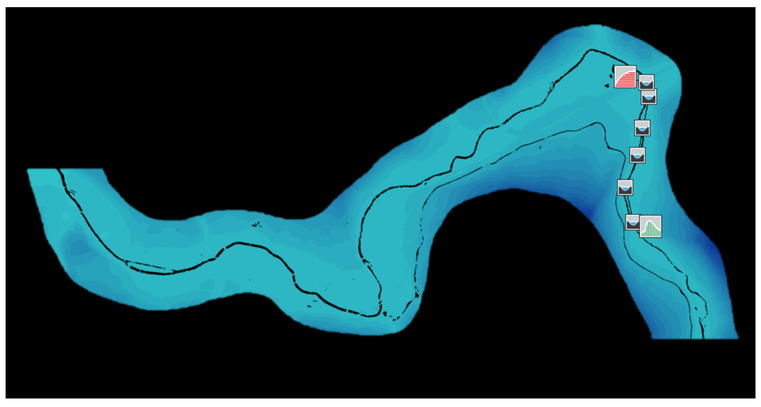
The floods of 1894 (13th and 15th November, two distinct floods in three days) are reported as '*most serious and calamitous*' on record (The Bath Herald, 1894). The socio-economic impacts of the floods on the population triggered social response and an emergency committee was formulated and two separate relief funds were raised.

➥Following the catastrophic floods and their immediate relief , an engineering report was commissioned to G. Remington who suggested to build a tunnel to divert the floodwaters (£69,300 cost).

1960 Flood

The flood of 1960 was considered a catalyst event for the policy of the City of Bath. The event was smaller than previous historic floods but due to the development of the city, the economic impact was vast. Bath's Flood Relief Fund was empty at the time so the Major Disaster Plan and a detailed plan for future emergencies were put in place.

➥In 1964, the Bath Flood Protection Scheme (1964-1974) was initiated with improvements including the deepening of the river bed, the removal of obstructions and the replacement of Old Bridge with Churchill Bridge.



Historical changes in river hydraulics

Historical changes in river hydraulics. Top: Old weir in 1960 and Pulteney weir 2019. Bottom: Old bridge in 1957, Churchill Bridge in 1975.

Scan me

How can we use documentary evidence of past flood events for contemporary flood risk assessments?

www.hydric-bath.weebly.com

References:

A record of the Great Flood in Bath and the surrounding district (1882). Special Issue of The Bath Herald. Bath: William Lewis and Son.
A record of the Great Flood in Bath and the surrounding district (1894). Special Issue of The Bath Herald. Bath: William Lewis and Son.
Bath in time, (2019) [ONLINE]. Available at: https://www.bathintime.co.uk/ [Accessed 5 September 2019].